

PCT

FORM PTO-1390
(REV 10-94)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

9663.40USWO

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5)

09/091704
TO BE ASSIGNED

INTERNATIONAL APPLICATION NO.

PCT/DK96/00535

INTERNATIONAL FILING DATE

16 December 1996

PRIORITY DATE CLAIMED

14 December 1995

TITLE OF INVENTION

A TRANSFER FOR DECORATING TEXTILES WITH COLOURED PATTERNS

APPLICANT(S) FOR DO/EO/US

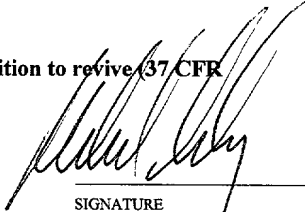
FRANKE, Kell Erik

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

U.S. APPLICATION NO (If known, see 37 C F R 1.5) TO BE ASSIGNED		INTERNATIONAL APPLICATION NO PCT/DK96/00535	ATTORNEY'S DOCKET NUMBER 9663.40USWO	
17. [X] The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492(a) (1)-(5)): Search Report has been prepared by the EPO or JPO..... \$930.00 International preliminary examination fee paid to USPTO (37 CFR 1.492(a)(1))..... \$720.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))..... \$790.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(3)) paid to USPTO \$1,070.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$98.00			CALCULATIONS PTO USE ONLY	
ENTER APPROPRIATE BASIC FEE AMOUNT =			\$1070	
Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).			\$0	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	64 -20 =	44	X \$22.00	\$968
Independent claims	6 -3 =	3	X \$82.00	\$246
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$0
TOTAL OF ABOVE CALCULATIONS =			\$2284	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).			\$0	
SUBTOTAL =			\$2284	
Processing fee of \$130.00 for furnishing the English translation later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+ \$0	
TOTAL NATIONAL FEE =			\$2284	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property			+ \$0	
TOTAL FEES ENCLOSED =			\$2284	
			Amount to be: refunded	\$
			charged	\$
a. [X] Check(s) in the amount of \$2284 to cover the above fees is enclosed.				
b. [] Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.				
c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>13-2725</u> .				
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.				
SEND ALL CORRESPONDENCE TO Michael B. Lasky MERCHANT & GOULD 3100 Norwest Center 90 South Seventh Street Minneapolis, MN 55403				
			 SIGNATURE	
			Michael B. Lasky NAME	
			29,555 REGISTRATION NUMBER	

13 OCT 1998

Applicant: Franke
Serial No.: 09/091704
Filed: 11 June 1998 Docket: 9663.40USWO
Title: A TRANSFER FOR DECORATING TEXTILES WITH COLOURED PATTERNS

CERTIFICATE UNDER 37 CFR 1.10

"Express Mail" mailing label number: EL17616527IUS

Date of Deposit: 13 October 1998

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By: 

Name: Mark L. Green

Box PCT
Assistant Commissioner for Patents
Washington, D.C. 20231

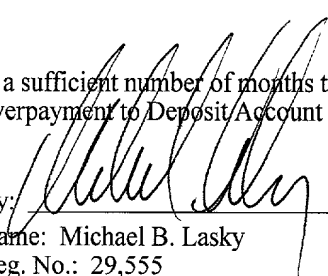
Sir:

We are transmitting herewith the attached:

- ☒ Transmittal Sheet in duplicate containing Certificate of Mailing
- ☒ Signed Combined Declaration and Power of Attorney
- ☒ Check(s) in the amount of \$130, for Completion of Missing Requirements
- ☒ Other: Submission of Missing Requirements
- ☒ Return postcard

Please consider this a PETITION FOR EXTENSION OF TIME for a sufficient number of months to enter these papers, if appropriate. Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725. A duplicate of this sheet is enclosed.

MERCHANT, GOULD, SMITH, EDELL,
WELTER & SCHMIDT
3100 Norwest Center, Minneapolis, MN 55402
(612) 332-5300

By: 
Name: Michael B. Lasky
Reg. No.: 29,555
MBL/ssh

10/16/1998 PVOLPE 00000020 09091704

01 FC:154

130.00 OP

09/091704

12 Rec'd PCT/PTO 12 JUN 1998

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

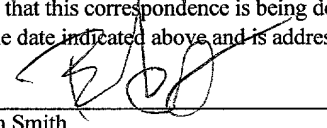
Applicant: FRANKE, Kell Erik Docket No.: 9663.40USWO
Serial No.: TO BE ASSIGNED (Corresponding to PCT/DK96/00535)
Filed: 11 June 1998
International Filing Date: 16 December 1996
Title: A TRANSFER FOR DECORATING TEXTILES WITH COLOURED
PATTERNS

CERTIFICATE UNDER 37 CFR 1.10:

"Express Mail" mailing label number: EM045418494US

Date of Deposit: 11 June 1998

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By: 
Name: William Smith

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment:

IN THE ABSTRACT

Insert the attached Abstract page into the application as the last page thereof.

IN THE SPECIFICATION

Enclosed is a copy of Form PCT/IB/308 indicating communication of the international application to the designated offices. A courtesy copy of the present specification is enclosed herewith, however, but the World Intellectual Property Office (WIPO) copy should be relied upon if it is already in the U.S. Patent Office.

IN THE CLAIMS

Please amend the claims as follows:

In claim 4, line 25, please replace "according to any one of claims 1-3" with --according to claim 1--.

In claim 5, line 30, please replace "according to any one of claims 1-3" with --according to claim 1--.

In claim 7, line 2, please replace "according to any one of claims 1-6" with --according to claim 1--.

In claim 8, line 8, please replace "according to any one of claims 1-7" with --according to claim 1--.

In claim 9, line 14, please replace "according to any one of claims 1-6" with --according to claim 1--.

In claim 10, line 20, please replace "according to any one of claims 1-6 and 9" with --according to claim 1--.

In claim 11, line 26, please replace "according to any one of claims 1-10" with --according to claim 1--.

In claim 12, line 1, please replace "according to any one of claims 1-10" with --according to claim 1--.

In claim 13, line 10, please replace "according to any one of claims 1-12" with --according to claim 1--.

In claim 14, line 17, please replace "according to any one of claims 1-13" with --according to claim 1--.

In claim 18, line 13, please replace "according to any one of claims 15-17" with --according to claim 15--.

In claim 19, line 18, please replace "according to any one of claims 15-18" with --according to claim 15--.

In claim 20, line 24, please replace "according to any one of claims 15-17" with --according to claim 15--.

In claim 21, line 29, please replace "according to any one of claims 15-17 and 20" with --according to claim

15--.

In claim 22, line 35, please replace "according to any one of claims 15-21" with --according to claim 15--.

In claim 23, line 7, please replace "according to any one of claims 15-21" with --according to claim 15--.

In claim 24, line 15, please replace "according to any one of claims 15-23" with --according to claim 15--.

In claim 25, line 22, please replace "according to any one of claims 15-24" with --according to claim 15--.

In claim 26, lines 31-32, please replace "according to any one of claims 1-14" with --according to claim 1--.

Please add the following new claims:

27. (New) A transfer according to claim 2, **characterized** in that the carrier sheet (1) consists of paper or a heat-resistant plastic sheet coated with a thin layer of silicone or polyolefin.

28. (New) A transfer according to claim 3, **characterized** in that the carrier sheet (1) consists of paper or a heat-resistant plastic sheet coated with a thin layer of silicone or polyolefin.

29. (New) A transfer according to claim 2, **characterized** in that the carrier sheet (1) is a polyolefin sheet.

30. (New) A transfer according to claim 3, **characterized** in that the carrier sheet (1) is a polyolefin sheet.

31. (New) A transfer according to claim 2, **characterized** in that the transparent elastomer layers (4) and/or (6) consist of an elastomer polyurethane having a high plasticizing point applied in the form of a solution in an organic solvent.

32. (New) A transfer according to claim 3, **characterized** in that the transparent elastomer layers (4) and/or (6) consist of an elastomer polyurethane having a high plasticizing point applied in the form of a solution in an organic solvent.

33. (New) A transfer according to claim 2, **characterized** in that the white elastomer layer (7) consists of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment, applied in the form of a solution in an organic solvent.

34. (New) A transfer according to claim 3, **characterized** in that the white elastomer layer (7) consists of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment, applied in the form of a solution in an organic solvent.

35. (New) A transfer according to claim 2, **characterized** in that the transparent elastomer layers (4) and/or (6) consist of an elastomer polyurethane having a high plasticizing point applied in the form of an aqueous solution.

36. (New) A transfer according to claim 3, **characterized** in that the transparent elastomer layers (4) and/or (6) consist of an elastomer polyurethane having a high plasticizing point applied in the form of an aqueous solution.

37. (New) A transfer according to claim 2, **characterized** in that the white elastomer layer (7) consists of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment, applied in the form of an aqueous solution.

38. (New) A transfer according to claim 3, **characterized** in that the white elastomer layer (7) consists of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment, applied in the form of an aqueous solution.

39. (New) A transfer according to claim 2, **characterized** in that the glue layer (8) consists of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C containing dispersed fine particles of a hot melt of copolyamide or high density polyethylene type having a melting point of 100-140 °C in the ratio 1:1, applied in the form of a solution of the polyurethane in an organic solvent with dispersed hot melt powder.

40. (New) A transfer according to claim 3, **characterized** in that the glue layer (8) consists of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C containing dispersed fine particles of a hot melt of copolyamide or high density polyethylene type having a melting point of 100-140 °C in the ratio 1:1, applied in the form of a solution of the polyurethane in an organic solvent with dispersed hot melt powder.

41. (New) A transfer according to claim 2, **characterized** in that the glue layer (8) consists of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C containing dispersed fine particles of a hot melt of copolyamide or high density polyethylene type having a melting point of 100-140 °C in the ratio 1:1, applied in the form of an aqueous solution of the polyurethane with dispersed hot melt powder.

42. (New) A transfer according to claim 3, **characterized** in that the glue layer (8) consists of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C containing dispersed fine particles of a hot melt of copolyamide or high density polyethylene type having a melting point of 100-140 °C in the ratio 1:1, applied in the form of an aqueous solution of the polyurethane with dispersed hot melt powder.

43. (New) A transfer according to claim 2, **characterized** in that the transparent elastomer layers (4) and/or (6), the white elastomer layer (7) and the glue layer (8) are printed on the carrier sheet (1) by silk screen printing processes in the same register and configuration on top of one another.

44. (New) A transfer according to claim 3, **characterized** in that the transparent elastomer layers (4) and/or (6), the white elastomer layer (7) and the glue layer (8) are printed on the carrier sheet (1) by silk screen printing processes in the same register and configuration on top of one another.

45. (New) A transfer according to claim 2, **characterized** in that the coloured pattern (5) is printed on the carrier sheet (1) or the first transparent elastomer layer (4) by means of a dry electrostatic colour toner printer, an ink jet printer with liquid dye or a thermotransfer colour printer, all of which are digitally controlled.

46. (New) A transfer according to claim 3, **characterized** in that the coloured pattern (5) is printed on the carrier sheet (1) or the first transparent elastomer layer (4) by means of a dry electrostatic colour toner printer, an ink jet printer with liquid dye or a thermotransfer colour printer, all of which are digitally controlled.

47. (New) A method according to claim 16, **characterized** by applying the transparent elastomer layers (4) and/or (6) in the form of an organic solution of an elastomer polyurethane having a high plasticizing point.

48. (New) A method according to claim 17, **characterized** by applying the transparent elastomer layers (4) and/or (6) in the form of an organic solution of an elastomer polyurethane having a high plasticizing point.

49. (New) A method according to claim 16, **characterized** by applying the white elastomer layer (7) in the form of an organic solution of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment.

50. (New) A method according to claim 17, **characterized** by applying the white elastomer layer (7) in the form of an organic solution of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment.

51. (New) A method according to claim 16, **characterized** by applying the transparent elastomer layers (4) and/or (6) in the form of an aqueous solution of an elastomer polyurethane having a high plasticizing point.

52. (New) A method according to claim 17, **characterized** by applying the transparent elastomer layers (4) and/or (6) in the form of an aqueous solution of an elastomer polyurethane having a high plasticizing point.

53. (New) A method according to claim 16, **characterized** by applying the white elastomer layer (7) in the form of an aqueous solution of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment.

54. (New) A method according to claim 17, **characterized** by applying the white elastomer layer (7) in the form of an aqueous solution of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment.

55. (New) A method according to claim 16, **characterized** by applying the glue layer (8) in the form of an organic solution of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C in which a fine hot melt powder of copolamide or high density polyethylene type having a melting point of 100-140 °C is dispersed in the ratio 1:1.

56. (New) A method according to claim 17, **characterized** by applying the glue layer (8) in the form of an organic solution of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C in which a fine hot melt powder of copolamide or high density polyethylene type having a melting point of 100-140 °C is dispersed in the ratio 1:1.

57. (New) A method according to claim 16, **characterized** by applying the glue layer (8) in the form of an aqueous solution of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C in which a fine hot melt powder of copolyamide or high density polyethylene type having a melting point of 100-140 °C is dispersed in the ratio 1:1.

58. (New) A method according to claim 17, **characterized** by applying the glue layer (8) in the form of an aqueous solution of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C in which a fine hot melt powder of copolyamide or high density polyethylene type having a melting point of 100-140 °C is dispersed in the ratio 1:1.

59. (New) A method according to claim 16, **characterized** by printing the transparent elastomer layers (4) and/or (6), the white elastomer layer (7) and the glue layer (8) on the carrier sheet (1) by silk screen printing processes in the same register and configuration on top of one another.

60. (New) A method according to claim 17, **characterized** by printing the transparent elastomer layers (4) and/or (6), the white elastomer layer (7) and the glue layer (8) on the carrier sheet (1) by silk screen printing processes in the same register and configuration on top of one another.

61. (New) A method according to claim 16, **characterized** by printing the coloured pattern (5) on the carrier sheet (1) or the first transparent elastomer layer (4) by means of a dry electrostatic colour toner printer, an ink jet printer with liquid dye or a thermotransfer colour printer, all of which are digitally controlled.

62. (New) A method according to claim 17, **characterized** by printing the coloured pattern (5) on the carrier sheet (1) or the first transparent elastomer layer (4) by means of a dry electrostatic colour toner printer, an ink jet printer with liquid dye or a thermotransfer colour printer, all of which are digitally controlled.

63. (New) A textile product on which a one- or multi-coloured pattern is attached by application from a transfer according to any one of claim 2.

64. (New) A textile product on which a one- or multi-coloured pattern is attached by application from a transfer according to any one of claim 3.

REMARKS

A new abstract page is supplied to conform to that appearing on the publication page of the WIPO application, but the new Abstract is typed on a separate page as required by U.S. practice.

The above preliminary amendment is made to remove multiple dependencies from claims.

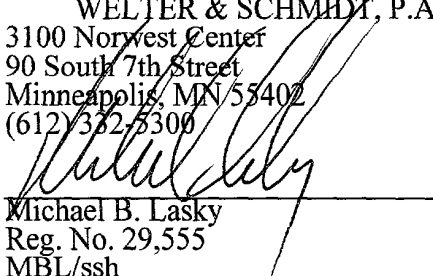
Applicant respectfully requests that the preliminary amendment described herein be entered into the record prior payment of the filing fees and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicant's primary attorney-of record, Michael B. Lasky.

Respectfully submitted,

MERCHANT, GOULD, SMITH, EDELL,
WELTER & SCHMIDT, P.A.
3100 Northwest Center
90 South 7th Street
Minneapolis, MN 55402
(612) 332-8300

Dated: ¹² June 1998

By: 
Michael B. Lasky
Reg. No. 29,555
MBL/ssh

ABSTRACT

A transfer capable of applying one- or multi-coloured patterns to textiles under heat and pressure comprises a carrier sheet (1) having a non-binding surface which carries (a) a one- or multi-coloured pattern (5) printed on the carrier sheet using a digitally controlled colour printer; (b) a transparent (6) or white-pigmented (7) elastomer layer of a polymer having a high plasticizing point printed configuratively on the pattern (5); and (c) a heat-activatable thermoplastic polymeric glue layer (8) printed configuratively on the transparent (6) or white-pigmented (7) elastomer layer or a heat-activatable hot melt granulate sprinkled on the elastomer layer while said layer was still wet. An even better encapsulation of the coloured pattern is obtained when the carrier sheet has printed thereon a first transparent elastomer layer of a polymer having a high plasticizing point, and the pattern is printed on this elastomer layer using a digitally controlled colour printer. Additional strength is obtained when both a transparent elastomer layer and a white-pigmented elastomer layer are printed on top of the coloured pattern.

CERTIFICATE UNDER 37 CFR 1.10:

"Express Mail" mailing label number: EM045418494US

Date of Deposit: 12 June 1998

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By: 

Name: William Smith

09/091704

A transfer for decorating textiles with coloured patterns

The invention relates to a heat application transfer for decorating textiles with coloured patterns having a particularly high washing and cleaning fastness, wherein the design is produced by means of a digitally controlled colour printer.

BACKGROUND OF THE INVENTION

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The most common way of making transfers for the application on textiles is by means of silk screen printing where each individual colour is applied to a sheet of silicone paper. Some colours, such as vinyl and plastisol colours, are heat-activatable, but are then not very fast without further treatment. To improve the fastness, the colours are usually provided with a hot melt granulate layer in the form of a powder or a fine-grained granulate mixed in an extender base, which is applied to the colours and serves as a special glue layer between textile and colours, thereby considerably improving the fastness. At high temperatures, however, e.g. during tumbling processes which use temperatures up to 140 °C in certain cases, they will get loose from the textile or a possible glue layer. Solvent-based two-component colours will be more stable against the action of temperature, but, when having been subjected to industrial washing and tumbling for an extended period of time, they will dry out and peel off from the textile.

30

The international patent application WO 92/07990 discloses a possible use of a colour copier with a two-component colour toner system in the making of a transfer for textiles. Such a two-component colour toner system, however, is not known in the market for colour copiers today. The present laser colour copiers use colour toners

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of a one-component thermoplastic resin type where no polymerization takes place. Furthermore, the system described in the above-mentioned international application depends on a colourless two-component extender base layer
5 which is applied on top of the coloured image and, immediately when wet, is coated with a thermoplastic granulate which serves as a glue layer. This embodiment, however, can only be applied to white textiles, and the transferred image will only be sharp on very smooth tex-
10 tiles.

It is prior art to use colour copiers for the transfer of images to a thermoplastics-coated transfer paper from which it can be transferred by heat and pressure to white
15 cotton textiles. The known products, however, exhibit great washing and cleaning weaknesses and thus just stand washing at about 40 °C for a limited number of times. The reason is primarily that the colour toners are relatively unprotected against mechanical impacts, and that they re-
20 main heat-activatable already at temperatures from about 90 °C. Further, printing is only possible on white textiles, and only on textiles where the predominant part consists of cotton. If it is desired to transfer colour images of this type to dark textiles, up to several addi-
25 tional operations are required for the lamination and adaptation of a white cover layer below the colour toners. This process is both expensive and time-consuming, and it is moreover not possible to make configurative patterns, but only complete cover faces.

30

OBJECT OF THE INVENTION

A number of data-controlled colour printers of various types are available which reproduce four-coloured raster
35 images with a resolution of 400 dpi or more with an almost photographic appearance. It is not possible in a

pure silk screen printing process to achieve a resolution of more than 100 dpi, and consequently fine details are lost in the reproduction. Accordingly, it would be a great advantage to be able to use such colour printers for the making of coloured and particularly multi-coloured configurative transfers for the textile industry. Of course, it would also be an advantage to be able to use data programs for the editing of images and designs together with scanners which transfer original images to data.

The object of the invention is to make a coloured configurative transfer for the textile industry which combines the great advantages achieved by the use of an electronic colour printer as the graphic unit with particularly great washing and cleaning fastness.

SUMMARY OF THE INVENTION

Since colour images generated from ordinary printers to a transfer substrate cannot readily be transferred to a textile in a configurative pattern, this is achieved according to the invention by using silk screen printing processes for making a protective layer and/or cover layer as well as a glue layer in accordance with the invention.

In its most simple embodiment the transfer of the invention is unique in that it comprises a carrier sheet having a non-binding surface which carries

- (a) a one- or multi-coloured pattern printed on the carrier sheet using a digitally controlled colour printer;
- (b) a transparent or white-pigmented elastomer layer of a polymer having a high plasticizing point printed configuratively on the pattern; and

- (c) a heat-activatable thermoplastic polymeric glue layer printed configuratively on the transparent or white-pigmented elastomer layer, or a heat-activatable hot melt granulate sprinkled on the elastomer layer while this was still wet.

It has surprisingly been found according to the invention that the colour toners which are usually used in multi-colour copiers and which may e.g. be based on thermoplastic polyol resins, migrate into the surface of the applied transparent or white-pigmented elastomer layer and harden together with said layer under the action of the isocyanate hardener contained in the elastomer layer. The colour toners hereby lose their thermoplastic nature and remain adhered to the elastomer layer, so that the coloured pattern or the image, after the transfer has been applied to a textile, stands washing, also at elevated temperatures.

If it is desired to encapsulate the coloured pattern or image so that it will be additionally resistant to wear and to the action of washing and cleaning, it may be provided with an additional protective layer. In this embodiment the transfer of the invention is unique in that it comprises a carrier sheet having a non-binding surface which carries

- (a) a first transparent elastomer layer of a polymer having a high plasticizing point printed configuratively on the carrier sheet;
- (b) a one- or multi-coloured pattern printed on the first elastomer layer using a digitally controlled colour printer;
- (c) a second transparent or white-pigmented elastomer layer of a polymer having a high plasticizing point printed configuratively on the pattern; and

- (d) a heat-activatable thermoplastic polymeric glue layer printed configuratively on the transparent or white-pigmented elastomer layer, or a heat-activatable hot melt granulate sprinkled on the elastomer layer while this was still wet.

Further, if the transfer is intended to be applied to very coarse or uneven textiles, and if it is desired to maintain fine details in the coloured pattern or image, the transfer may be provided with both a white-pigmented and a transparent elastomer layer (c); in this case the very strongest encapsulation of the coloured pattern or image is achieved when first a transparent elastomer layer and then a white-pigmented elastomer layer are applied.

In the latter embodiment the transfer of the invention is unique in that it comprises a carrier sheet having a non-binding surface which carries

- (a) a first transparent elastomer layer of a polymer having a high plasticizing point printed configuratively on the carrier sheet;
- (b) a one- or multi-coloured pattern printed on the elastomer layer using a digitally controlled colour printer;
- (c) a second transparent elastomer layer of a polymer having a high plasticizing point printed configuratively on the pattern;
- (d) a white-pigmented elastomer layer of a polymer having a high plasticizing point printed configuratively on the second transparent elastomer layer; and
- (e) a heat-activatable thermoplastic polymeric glue layer printed configuratively on the white-pigmented elastomer layer, or a heat-activatable hot melt

granulate sprinkled on the elastomer layer while this was still wet.

- The carrier sheet having a non-binding surface may e.g. consist of paper or a heat-resistant plastics sheet, e.g. of polyester, coated with a thin layer of silicone or polyolefin; or it may e.g. consist of a polyolefin sheet, expediently a sheet of high density (HD) polypropylene.
- 10 The transparent elastomer layers may advantageously consist of an elastomeric polyurethane having a high plasticizing point applied in the form of a solution in an organic solvent. This is particularly advantageous in connection with the use of colour copiers of the dry electrostatic type which normally apply a thin silicone oil to the surface of the fixing rollers to prevent toner particles from sticking to the rollers. Small amounts of this silicone oil are applied to the colour toners in the printing and can be detrimental to the adhesion of the
- 15 subsequent elastomer layer. But the organic solvent in the polyurethane layer dissolves the silicone film so that the polyurethane and the toners combine to form a homogeneous unit.
- 20
- 25 However, with other types of colour printers, or if other steps are taken to avoid the silicone film, it is also possible to use corresponding polyurethanes in aqueous solution.
- 30 The white elastomer layer, which may optionally be omitted if the transfer is to be used for applying a pattern to white textiles, may advantageously consist of the same type of polyurethane as above, pigmented with a white inorganic pigment and applied from an organic or aqueous
- 35 solution.

The final glue layer may advantageously consist of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C containing dispersed fine particles of a hot melt of copolyamide or high density polyethylene type having a melting point of 100-140 °C in the ratio 1:1, applied in the form of an organic or aqueous solution of the polyurethane with dispersed hot melt powder.

A special variation of the glue layer comprises laminating a thermoplastic moulded polyurethane sheet on the transparent or white elastomer layer. A 100 µm thick transparent or coloured aromatic polyester film having a plasticizing point of about 160 °C, a hardness of 93° Shore and an elasticity of 400% is particularly useful for the purpose. The silk screen printed polyurethane layers and the polyurethane sheet can be laminated together at 160 °C under slight pressure, so that the sheet does not melt, but only adheres to the applied layer. During application of the finished transfer to a textile, which takes place at 200 °C and 320 kPa in 12 seconds, the polyurethane sheet melts and forms a very strong glue layer between the textile and printed image.

In an advantageous embodiment of the invention, the transparent elastomer layers, the white elastomer layer and the glue layer are printed on the carrier sheet by silk screen printing processes in the same register and configuration on top of one another. Owing to possible inaccuracies in the register, however, the glue layer normally protrudes 1-2 mm beyond the configuration of the other layers in practice.

As stated, the one- or multi-coloured pattern is printed on the first elastomer layer using a digitally controlled colour printer. The invention is very flexible with respect to the selection of colour printer. A rough dis-

inction may be made between digitally controlled colour printers which work with powder toners, liquid dyes or colour ribbons.

- 5 Accordingly, the coloured pattern in a transfer of the invention will normally be printed on the first transparent elastomer layer by means of a dry electrostatic colour toner printer, an ink jet printer with liquid dye or a thermotransfer colour printer, all of which are digi-
10 tally controlled.

The invention also comprises a method of making a transfer as described above, said method being unique by, on a carrier sheet having a non-binding surface,

- 15 (a) printing a one- or multi-coloured pattern using a digitally controlled colour printer;
(b) on top of the pattern, configuratively printing a transparent or white-pigmented elastomer layer of a polymer having a high plasticizing point; and
20 (c) on top of the transparent or white-pigmented elastomer layer, printing a heat-activatable thermoplastic polymeric glue layer, or, while the elastomer layer is still wet, sprinkling a heat-activatable hot melt granulate on said layer.

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Another embodiment of the method of the invention is unique by, on a carrier shet (1) having a non-binging surface,

- (a) configuratively printing a first transparent elastomer layer (4) of a polymer having a high plasticizing point;
30 (b) on top of the first elastomer layer (4), printing a one- or multi-coloured pattern (5) using a digitally controlled colour printer;
35 (c) on top of the pattern (5), configuratively printing a second transparent (6) or white-pigmented (7) elas-

tomers layer of a polymer having a high plasticizing point; and

- (d) on top of the transparent (6) or white-pigmented (7) elastomer layer, configuratively printing a heat-activatable thermoplastic polymeric glue layer (8), or, while the elastomer layer is still wet, sprinkling a heat-activatable hot melt granulate on said layer.

Another embodiment of the method of the invention is unique by, on a carrier sheet having a non-binding surface,

- (a) configuratively printing a first transparent elastomer layer of a polymer having a high plasticizing point;
- (b) on top of the first elastomer layer, printing a one- or multi-coloured pattern using a digitally controlled colour printer;
- (c) on top of the pattern, configuratively printing a second transparent elastomer layer of a polymer having a high plasticizing point;
- (d) on top of the second elastomer layer, configuratively printing a white-pigmented elastomer layer of a polymer having a high plasticizing point; and
- (e) on top of the white-pigmented elastomer layer, configuratively printing a heat-activatable thermoplastic polymeric glue layer, or, while the elastomer layer is still wet, sprinkling a heat-activatable hot melt granulate on said layer.

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In accordance with the disclosure above, the transparent elastomer layers are advantageously applied in the form of an organic solution of an elastomer polyurethane having a high plasticizing point; but it may also take place in the form of an aqueous solution.

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The white elastomer layer may then be applied in the form of a corresponding organic or aqueous polyurethane solution which is pigmented with a white pigment.

5 Furthermore, the glue layer may advantageously be applied in the form of an organic or aqueous solution of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C, in which a fine hot melt powder of copolyamide or high density polyethylene type having a
10 melting point of 100-140 °C is dispersed in the ratio 1:1.

In an advantageous embodiment of the method of the invention, the transparent elastomer layers, the white elastomer layer and the glue layer are printed on the carrier
15 sheet by silk screen printing processes in the same register and configuration on top of one another. But, as mentioned before, owing to possible inaccuracies in the register, the glue layer will normally be printed in a
20 configuration which protrudes 1-2 mm beyond the configuration of the other layers.

Furthermore, the coloured pattern is generally printed on the first transparent elastomer layer by means of a dry
25 electrostatic colour toner printer, an ink jet printer with liquid dye or a thermotransfer colour printer, all of which are digitally controlled.

According to the invention, if the transfer is to be used
30 for applying a pattern to white textiles, it is possible to omit the white elastomer layer and to print the glue layer directly on the second transparent elastomer layer.

According to the invention, if the transfer is to be used
35 for applying a pattern to textiles having a very even and non-textured surface, it is also possible to omit the

second transparent elastomer layer and to print the white elastomer layer directly on the one- or multi-coloured pattern.

5 Finally, according to the invention, it is also possible to omit the glue layer and, where application to white textiles is involved, optionally also the white elastomer layer, in which case the surface of the white elastomer layer and the second transparent elastomer layer, respec-
10 tively, are modified to be heat-activatable. This is done most expediently according to the invention in that immediately after the printing of the elastomer layer, while this is still wet, a fine hot melt powder of copolyamide or high density polyethylene type having a melting point
15 of 100-140 °C is sprinkled on the surface.

The invention also comprises textile products on which a one- or multi-coloured pattern is attached by application from a transfer of the invention.

20 The method and the transfer of the invention give evident cost-saving advantages particularly in case of a low number of printed copies.

25 DETAILED DESCRIPTION OF THE INVENTION

The invention will be illustrated more fully by the following detailed description of various embodiments of it with reference to the drawing, which schematically shows
30 the structure of a transfer of the invention.

The drawing shows a carrier sheet (1) composed of a sheet of paper or a heat-resistant plastics sheet (2) coated with a thin release layer of silicone or polyolefin (3).
35 A first transparent elastomer layer (4) is configuratively printed by silk screen printing on the silicone or

polyolefin surface, and, on top of said elastomer layer, a one- or multi-coloured pattern (5) is printed with a digitally controlled colour printer. On top of the coloured pattern, a second transparent elastomer layer (6) is configuratively printed, again by silk screen printing, and, in the same manner, a white-pigmented elastomer layer is printed on said second elastomer layer. Uppermost, a heat-activatable thermoplastic polymeric glue layer (8) is printed in the same manner.

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A thin transparent elastomer layer (4), e.g. an organic solution of an elastomeric polyurethane having a high plasticizing point, is applied by silk screen printing with a 34T blanket in a desired configuration on a carrier sheet (1) having a non-binding surface, e.g. of paper or heat-resistant plastics sheet (2) coated with silicone or polyolefin (3) or entirely of polyolefin, e.g. HD polypropylene. This first elastomer layer (4) is then dried in an infrared/hot air drying tunnel at about 70-80 °C.

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The desired pattern (5) is now printed in mirror-inverted fashion on the carrier sheet (1) with applied elastomer layer (4) within the elastomer-coated area by means of a colour printer, e.g. a four-colour copier of the "Ricoh NC5006" type, which works with a dual powder toner system and a resolution of 400 dpi. After the print has been fixed in the heat section of the machine, the toners, which consist of thermoplastics, are still heat-activatable even at relatively low temperatures (about 90 °C). To stabilize the toners so that they can later stand higher temperatures, a second transparent elastomer layer (6) is printed on top of the colour toners, e.g. of the same polyurethane solution as the elastomer layer (4).

The solvent of the polyurethane layer neutralizes the silicone film, which is applied to the toners during the

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heat fixation in the colour copier, and the polymer/isocyanate mixture combines with the toners to form a homogeneous unit which hardens at room temperature by means of the atmospheric humidity. A well protected colour layer has now been provided between two polyurethane layers which are not heat-activatable at the application temperature of the transfer.

Since the covering power of the toners is none too good on others than white textiles, a white-pigmented elastomer layer (7), e.g. of a polyurethane with the same chemical composition as the preceding transparent layers and in the same configuration as the other layers, is now applied. A heat-activatable granulate of a polyamide-based hot melt, which serves as a glue layer between the transfer and the substrate, may now be applied to the elastomer layer (7) while it is still wet, or a heat-activatable thermoplastic polymeric glue layer (8), e.g. consisting of heat-activatable polyurethane thermoplastics mixed with a fine hot melt powder of copolyamide in the ratio 1:1, is applied to the white cover layer (7).

The transfer may now be applied to all ordinary textiles in the usual manner at 170-180 °C in 8-12 seconds and a pressure of about 310 kPa.

With respect to useful colour printers, a rough distinction may be made between digitally controlled colour printers working with powder toners, liquid dyes or colour ribbons. Examples of colour copiers using powder toners in a dry electrostatic process, include: "Canon® CLC 700", "Ricoh® NC 5006", and "Rank Xerox® 5775". Examples of digitally controlled colour printers using liquid dyes include: "Indigo Eprint 1000", "IBM Color Jetprinter PS 4079" and "Canon® BJC-880". Finally, examples of digitally controlled so-called thermotransfer colour printers

working with colour ribbons include: "ABDICK", "Seiko® ColorPoint 2 PSF-14" and "Fargo Pictura 310".

Each system has its cost/quality parameters between which
5 one may choose freely. The elastomer layers encapsulating the colour layer may be adapted to the various printers e.g. by means of surface-active additives or electronic surface treatment. This applies to both water-based and solvent-based polymers. If, however, liquid dyes are
10 used, waterproof dyes will always be preferred.

Modern digitally controlled colour printers are compatible with a number of standard software editing programs, e.g. Windows 3.X, IBM OS/2, Apple System 6 and 7 as well
15 as the more advanced Adobe Postscript Level 2.

Preferred polymers having a high plasticizing point for making the elastomer layers (4), (6) and (7) are elastomeric polyurethanes, such as a one-component fully reacted linear polyurethane on the basis of polyester and
20 aliphatic diisocyanate or a one-component fully reacted polyurethane on the basis of polyester and aromatic diisocyanate. The thermoplastic polymer for use in the glue layer (8) is preferably a corresponding polyurethane adjusted to have a lower plasticizing point and thus to be
25 heat-activatable together with the hot melt powder.

Examples of other useful elastomer systems include two-component polyurethane textile colours e.g. "Bargoscreen
30 S18/50" from the company Aaberg or "Maraflor TK" from the company Marabu. These colour systems consist of 1-methoxy-2-propyl acetate and 3-methoxy-n-butyl acetate to which polyurethane binders are added. Diisocyanate is used as a binder. The recommended diluents for these systems - cyclohexanone or ethyl glycol acetate - are relatively aggressive against the toners in the image layer
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and must therefore be added in as small amounts as possible, while the carrier sheet should be treated carefully without greater mechanical impacts until the elastomer layer on the toners has dried.

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It should be stressed that, in addition to said polyurethane components, a large number of other thermoplastic resins may also be used, such as e.g. polyolefins, ethylene vinyl acetate copolymers, ethylene ethyl acrylate copolymers, ethylene acrylic acid copolymers, ionomers, polyesters, polyamides, acrylic resins, etc.

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When using elastomer systems which are water-dispersed and therefore do not contain solvents, washing may give rise to separation problems between the toner layer and the subsequently applied transparent layer. The reason is that colour copiers of the dry electrostatic type normally use a thin silicone oil on the surface of the fixing rollers which prevents toner particles from sticking to the rollers. It is inevitable that small amounts of silicone oil are left on the surface of the colour toners and cause separation or formation of air pockets between the toner layer and the subsequently applied polyurethane layer, particularly during washing. If it is desired to use a water-based colour/lacquer system, the problem may be solved by using infrared heat fixing of the toners alone, or ceramic fixing rollers, or other rollers which do not require silicone oil.

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30 Preferred method of preparation:

As will appear from the drawing, several successive polymer and image layers, which form the finished transfer, are printed individually on a carrier sheet (1) normally consisting of a sheet of paper of about 105 g/m² (2) coated with a release layer of silicone (3).

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First a transparent elastomer layer (4) is printed, preferably consisting of a polyurethane having the highest possible melting point, which following transfer to the substrate forms a protective top layer. Particularly useful was a 25% solution in propylene glycol methyl ether of a linear fully reacted polyurethane on the basis of polyester and aliphatic diisocyanate having a plasticizing point of 195-205 °C.

10

Then the desired image (5) is printed in a dry electrostatic colour copier. A particularly suitable colour copier is a "Ricoh NC5006" which produces colour copies with a resolution of 400 dpi with 256 shades per point. In other colour copiers, the copying paper runs about a drum, and this restricts the selection of copying materials. NC5006 therefore uses a transfer belt for transferring the original image to the copying sheet. The straight paper movement allows copying on different types of paper and transparencies.

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A transparent elastomer layer (6) is now printed, said layer combining with the toners and consisting of the same composition as the first elastomer layer (4). The toners are now well protected between the two elastomer layers. Then, a white cover layer (7) is printed, consisting of the same polyurethane type as the first and second transparent elastomer layers, but pigmented with organic or inorganic colour pigments, e.g. titanium dioxide.

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Finally, a glue layer (8) connecting the transfer (3) with the textile is printed. The glue layer consists of a mixture of a polyurethane which is a more softly adjusted one-component polyurethane having a melting point of 150-160 °C, and a hot melt powder on copolyamide basis in the

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ratio 1:1. The melting point of the hot melt powder is about 115-130 °C, and the grain size is not above 80 µm. A particularly suitable hot melt powder has been found to be a copolyamide on the basis of polymerized, predominantly dimerized fatty acids or their esters and substantially aliphatic diamines. These hot melts possess great resistance to washing and cleaning agents, even at high temperatures (80-90 °C).

- 10 The one-component polyurethane glue primarily serves as a filler for the powdered hot melt, but also serves per se as thermoplastics. For example, a 35% solution in dimethyl formamide/toluene/methyl ethyl ketone of a one-component polyurethane glue on the basis of polyester and aromatic diisocyanate having a plasticizing point of 150-160 °C is particularly useful for the purpose.

The glue layer serves as a purely reversible thermoplastic, i.e. no hardening or cross-linking takes place in the application of the transfer to the textile by means of heat and pressure. Under the action of heat and pressure in the application to the textile, both the hot melt and the one-component polyurethane melt and are pressed down between the textile fibres and thereby anchor the transfer mechanically.

EXAMPLE 1

A four-coloured pattern or image (5) of a two-component toner having a particle size of 6.4 µm was applied directly to the non-binding surface of a carrier sheet (1) in a Ricoh NC 5006 colour copier. Subsequently, a white-pigmented two-component polyurethane elastomer sheet (7) was applied on top of the toner image by silk screen printing. The two-component elastomer used was "Bargoscreen S18/50" polyurethane textile colour from Aa-

berg Druckfarben, Aaberg, Switzerland, admixed with 10% polydiisocyanate hardener. It is essential to the durability of the transfer that the toner resin has an extremely good contact with the white two-component polyurethane elastomer, so that common polymerization of the two materials takes place. As the heat fixing unit in the copier uses dimethyl polysiloxane silicone oil as a release agent on the heat rollers, small amounts of it will be transferred to the surface of the toner layer and thereby reduce the surface tension. It was therefore necessary to add a small amount of a wetting agent to the white-pigmented polyurethane elastomer to increase its wetting capacity, and 0.5% wetting agent of the brand "BYK 358" from BYK-Chemie GmbH, Wessel, Germany was added. The carrier sheet was fed through a tunnel drying oven in 105 °C hot air to dry the white layer before further processing. Then a transparent two-component polyurethane layer from the same series, "Bargoscreen S18/50", as the white layer was applied by silk screen printing, and while it was still wet, a layer of hot melt copolyamide granulate of the brand "Kiwomelt 2095 F" from Kissel & Wolf GmbH, Wiesloch, Germany, was added, forming the glue layer. The finished transfer was applied to a cotton/polyester textile at 165 °C at a pressure of 310 kPa in 10 seconds. This type of transfer is very versatile and is suitable for most types of textiles.

EXAMPLE 2

A transparent elastomer layer (4) of a linear one-component polyurethane on the basis of polyester and aliphatic diisocyanate was applied in a desired configuration by silk screen printing with a 34T blanket on a carrier sheet (1) consisting of a 105 g/m² sheet of paper (2), coated with a release layer of silicone (3). Then the carrier sheet with the applied elastomer layer was

introduced into a Ricoh colour copier of the type NC5006, and a four-coloured pattern (5) of a two-component toner having a particle size of 6.4 μm was transferred within the area of the elastomer layer (4). A transparent elastomer layer (6) on the basis of the said one-component polyester urethane with the same configuration as the first elastomer layer was printed on top of the toner layer. Further, a titanium dioxide-pigmented white polyurethane layer (7) of the same structure as the preceding layers was printed. Finally, a glue layer (8) was printed, consisting of a mixture of a 35% solution in dimethyl formamide/toluene/methyl ethyl ketone of a one-component polyurethane glue on the basis of polyester and aromatic diisocyanate having a plasticizing point of 150-160 °C and a non-dissolved hot melt powder based on copolyamide. In this example, the individual elastomer layers were adjusted relatively softly, viz. with an ultimate/tensile strength of about 700-800%. Between the printing of the individual layers, elastomer layer, white cover layer and glue layer, these are dried in a hot air/infrared drying oven at 70-80 °C, and the transfer is then dry, while the final hardening is completed only after about 10 hours at room temperature or 3-4 hours in a heating cabinet at 60 °C. The finished transfer was transferred to a cotton/polyester textile at 180 °C and a pressure of 310 kPa in 10 seconds. This type of transfer is particularly suitable for textured elastic textiles.

EXAMPLE 3

Like in the preceding example, an elastomer layer (4), a toner layer (5), an elastomer layer (6), a white cover layer (7) and finally a glue layer (8) were printed successively on a carrier sheet (1) in the described manner. This time a polyurethane with a somewhat harder setting was used, viz. with an ultimate/tensile strength of 100-

200%. The powdered hot melt was also the same as mentioned above. The transfer is applied to the textile in the same manner as in example 1. Such a setting is suitable particularly for non-elastic woven textiles for work
5 clothes.

Conclusively, the described transfer material, according to the field of use, may be adapted for various textiles, as the various elastomer layers may have a soft or a hard
10 setting and thereby affect the elasticity and the resistance to temperatures and mechanical conditions.

Of course, it is possible to modify and vary the product of the invention within the scope of the invention. Thus,
15 e.g. a silicone-coated plastics sheet may be used instead of paper as a carrier sheet. Further, it is also possible to omit the white cover layer if the transfer is just used on white textiles and to apply a transparent elastomer layer on the colour toner layer and then the glue
20 layer. Moreover, while the white cover layer (7) or the last transparent elastomer layer (6) is still wet, it may also be decided to apply to said layer a layer of hot melt powder which is fused into the elastomer in an infrared/hot air drying oven. This method saves a printing
25 operation, but the transfer has a somewhat harder appearance on the textile. Finally, the white cover layer may be printed directly on the toners, thereby allowing the one elastomer layer to be omitted. However, this variation can be used only where a textile having a very even
30 non-textured surface is involved, since, otherwise, the white elastomer will pull the toners apart during the application and thereby create a more blurred image.

PATENT CLAIMS

1. A transfer capable of applying one- or multi-coloured patterns to textiles under heat and pressure, **character-**
5 **ized** in that it comprises a carrier sheet (1) having a non-binding surface which carries
- (a) a one-or multi-coloured pattern (5) printed on the carrier sheet using a digitally controlled colour printer;
 - 10 (b) a transparent (6) or white-pigmented (7) elastomer layer of a polymer having a high plasticizing point printed configuratively on the pattern (5); and
 - (c) a heat-activatable thermoplastic polymeric glue layer (8) printed configuratively on the transparent (6) or
15 white-pigmented (7) elastomer layer, or a heat-activatable hot melt granulate sprinkled on the elastomer layer while this was still wet.
2. A transfer capable of applying one- or multi-coloured patterns to textiles under heat and pressure, **character-**
20 **ized** in that it comprises a carrier sheet (1) having a non-binding surface which carries
- (a) a first transparent elastomer layer (4) of a polymer having a high plasticizing point printed configura-
25 tively on the carrier sheet (1);
 - (b) a one- or multi-coloured pattern (5) printed on the first elastomer layer (4) using a digitally controlled colour printer;
 - (c) a second transparent (6) or white-pigmented (7) elastomer layer of a polymer having a high plasticizing point printed configuratively on the pattern (5); and
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 - (d) a heat-activatable thermoplastic polymeric glue layer (8) printed configuratively on the transparent (6) or white-pigmented (7) elastomer layer, or a heat-
35 activatable hot melt granulate sprinkled on the elastomer layer while this was still wet.

3. A transfer capable of applying one- or multi-coloured patterns to textiles under heat and pressure, **characterized** in that it comprises a carrier sheet (1) having a non-binding surface which carries
- 5 (a) a first transparent elastomer layer (4) of a polymer having a high plasticizing point printed configuratively on the carrier sheet;
- (b) a one- or multi-coloured pattern (5) printed on the elastomer layer (4) using a digitally controlled colour printer;
- 10 (c) a second transparent elastomer layer (6) of a polymer having a high plasticizing point printed configuratively on the pattern (5);
- 15 (d) a white-pigmented elastomer layer (7) of a polymer having a high plasticizing point printed configuratively on the second transparent elastomer layer (6); and
- (e) a heat-activatable thermoplastic polymeric glue layer
- 20 (8) printed configuratively on the white elastomer layer (7) or a heat-activatable hot melt granulate sprinkled on the elastomer layer while this was still wet.
- 25 4. A transfer according to any one of claims 1-3, **characterized** in that the carrier sheet (1) consists of paper or a heat-resistant plastic sheet coated with a thin layer of silicone or polyolefin.
- 30 5. A transfer according to any one of claims 1-3, **characterized** in that the carrier sheet (1) is a polyolefin sheet.
6. A transfer according to claim 5, **characterized** in that the polyolefin sheet consists of high density polypropylene.
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7. A transfer according to any one of claims 1-6, **characterized** in that the transparent elastomer layers (4) and/or (6) consist of an elastomer polyurethane having a high plasticizing point applied in the form of a solution in an organic solvent.

8. A transfer according to any one of claims 1-7, **characterized** in that the white elastomer layer (7) consists of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment, applied in the form of a solution in an organic solvent.

9. A transfer according to any one of claims 1-6, **characterized** in that the transparent elastomer layers (4) and/or (6) consist of an elastomer polyurethane having a high plasticizing point applied in the form of an aqueous solution.

10. A transfer according to any one of claims 1-6 and 9, **characterized** in that the white elastomer layer (7) consists of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment, applied in the form of an aqueous solution.

11. A transfer according to any one of claims 1-10, **characterized** in that the glue layer (8) consists of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C containing dispersed fine particles of a hot melt of copolyamide or high density polyethylene type having a melting point of 100-140 °C in the ratio 1:1, applied in the form of a solution of the polyurethane in an organic solvent with dispersed hot melt powder.

12. A transfer according to any one of claims 1-10, **characterized** in that the glue layer (8) consists of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C containing dispersed fine particles of a hot melt of copolyamide or high density polyethylene type having a melting point of 100-140 °C in the ratio 1:1, applied in the form of an aqueous solution of the polyurethane with dispersed hot melt powder.

13. A transfer according to any one of claims 1-12, **characterized** in that the transparent elastomer layers (4) and/or (6), the white elastomer layer (7) and the glue layer (8) are printed on the carrier sheet (1) by silk screen printing processes in the same register and configuration on top of one another.

14. A transfer according to any one of claims 1-13, **characterized** in that the coloured pattern (5) is printed on the carrier sheet (1) or the first transparent elastomer layer (4) by means of a dry electrostatic colour toner printer, an ink jet printer with liquid dye or a thermotransfer colour printer, all of which are digitally controlled.

15. A method of making a transfer capable of applying one- or multi-coloured patterns to textiles under heat and pressure, **characterized** by, on a carrier sheet (1) having a non-binding surface,

(a) printing a one- or multi-coloured pattern (5) using a digitally controlled colour printer;

(b) on top of the pattern (5), configuratively printing a transparent (6) or white-pigmented (7) elastomer layer of a polymer having a high plasticizing point; and

(c) on top of the transparent (6) or white-pigmented (7) elastomer layer, configuratively printing a heat-

activatable thermoplastic polymeric glue layer (8) or, while the elastomer layer is still wet, sprinkling a heat-activatable hot melt granulate on said layer.

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16. A method of making a transfer capable of applying one- or multi-coloured patterns to textiles under heat and pressure, **characterized** by, on a carrier sheet (1) having a non-binding surface,

- 10 (a) configuratively printing a first transparent elastomer layer (4) of a polymer having a high plasticizing point;
- (b) on top of the first elastomer layer (4), printing a one- or multi-coloured pattern (5) using a digitally controlled colour printer;
- 15 (c) on top of the pattern (5), printing a second transparent (6) or white-pigmented (7) elastomer layer of a polymer having a high plasticizing point; and
- (d) on top of the transparent (6) or white-pigmented (7) elastomer layer, configuratively printing a heat-activatable thermoplastic polymeric glue layer (8) or, while the elastomer layer is still wet, sprinkling a heat-activatable hot melt granulate on said layer.

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17. A method of making a transfer capable of applying a one- or multi-coloured pattern to textiles under heat and pressure, **characterized** by, on a carrier sheet (1) having a non-binding surface,

- 30 (a) configuratively printing a first transparent elastomer layer (4) of a polymer having a high plasticizing point;
- (b) on top of the first elastomer layer (4), printing a one- or multi-coloured pattern (5) using a digitally controlled colour printer;
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- (c) on top of the pattern (5), configuratively printing a second transparent elastomer layer (6) of a polymer having a high plasticizing point;
- (d) on top of the second elastomer layer (6), configuratively printing a white-pigmented elastomer layer (7) of a polymer having a high plasticizing point; and
- (e) on top of the white-pigmented elastomer layer (7), configuratively printing a heat-activatable thermoplastic polymeric glue layer (8) or, while the elastomer layer is still wet, sprinkling a heat-activatable hot melt granulate on said layer.

18. A method according to any one of claims 15-17, **characterized** by applying the transparent elastomer layers (4) and/or (6) in the form of an organic solution of an elastomer polyurethane having a high plasticizing point.

19. A method according to any one of claims 15-18, **characterized** by applying the white elastomer layer (7) in the form of an organic solution of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment.

20. A method according to any one of claims 15-17, **characterized** by applying the transparent elastomer layers (4) and/or (6) in the form of an aqueous solution of an elastomer polyurethane having a high plasticizing point.

21. A method according to any one of claims 15-17 and 20, **characterized** by applying the white elastomer layer (7) in the form of an aqueous solution of an elastomer polyurethane having a high plasticizing point which is pigmented with a white inorganic pigment.

22. A method according to any one of claims 15-21, **characterized** by applying the glue layer (8) in the form of

an organic solution of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C in which a fine hot melt powder of copolamide or high density polyethylene type having a melting point of 100-140 °C is dispersed in the ratio 1:1.

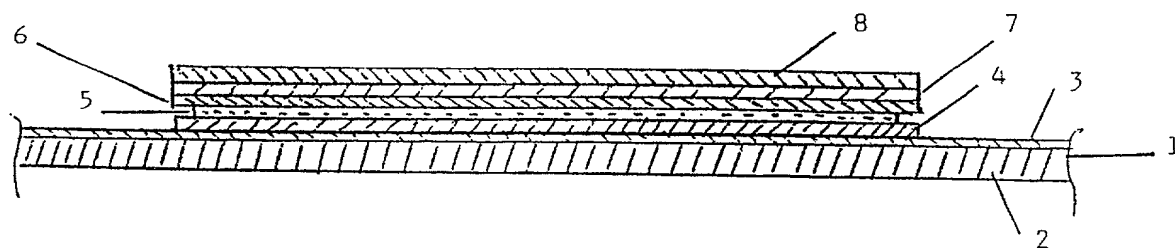
23. A method according to any one of claims 15-21, **characterized** by applying the glue layer (8) in the form of an aqueous solution of polyurethane thermoplastics having a plasticizing point in the range 120-160 °C in which a fine hot melt powder of copolyamide or high density polyethylene type having a melting point of 100-140 °C is dispersed in the ratio 1:1.

24. A method according to any one of claims 15-23, **characterized** by printing the transparent elastomer layers (4) and/or (6), the white elastomer layer (7) and the glue layer (8) on the carrier sheet (1) by silk screen printing processes in the same register and configuration on top of one another.

25. A method according to any one of claims 15-24, **characterized** by printing the coloured pattern (5) on the carrier sheet (1) or the first transparent elastomer layer (4) by means of a dry electrostatic colour toner printer, an ink jet printer with liquid dye or a transfer colour printer, all of which are digitally controlled.

26. A textile product on which a one- or multi-coloured pattern is attached by application from a transfer according to any one of claims 1-14.

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MERCHANT, GOULD, SMITH, EDELL, WELTER & SCHMIDT

United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **A TRANSFER FOR DECORATING TEXTILES WITH COLOURED PATTERNS**

The specification of which

a. ☐ is attached hereto

b. ☒ was filed on 11 June 1998 as application serial no. _____ and claimed in international no: PCT/DK96/00535 filed 16 December 1996 and as amended on _____ (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56 (attached hereto).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

a. ☐ no such applications have been filed.

b. ☒ such applications have been filed as follows:

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)
Denmark	1417/95	14 December 1995	
ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

U.S. PROVISIONAL APPLICATION NUMBER	DATE OF FILING (Day, Month, Year)

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

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Reg. No. 40,481
 Reg. No. P-42,264
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 Reg. No. 27,612
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 Reg. No. 35,093
 Reg. No. 33,227
 Reg. No. 39,634
 Reg. No. 30,247
 Reg. No. 25,968
 Reg. No. 34,994
 Reg. No. 40,579
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 Reg. No. 32,612
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 Reg. No. 38,472
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 Reg. No. P-41,804
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 Reg. No. 29,165
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 Reg. No. 32,044
 Reg. No. 40,337
 Reg. No. 30,300
 Reg. No. 40,099
 Reg. No. 28,650
 Reg. No. 41,232
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 Reg. No. 37,209
 Reg. No. 37,703
 Reg. No. 25,767
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 Reg. No. 39,828
 Reg. No. 31,197
 Reg. No. 30,422
 Reg. No. 33,280
 Reg. No. 34,051
 Reg. No. 40,178
 Reg. No. 35,684
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 Reg. No. 29,114
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 Reg. No. 39,867
 Reg. No. 20,890
 Reg. No. P-43,261
 Reg. No. 27,054
 Reg. No. P-41,980
 Reg. No. 28,133
 Reg. No. P-42,236
 Reg. No. 39,536

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I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant, Gould, Smith, Edell, Welter & Schmidt to the contrary.

Please direct all correspondence in this case to Merchant, Gould, Smith, Edell, Welter & Schmidt at the address indicated below:

Merchant, Gould, Smith, Edell,
Welter & Schmidt
3100 Norwest Center
90 South Seventh Street
Minneapolis, MN 55402-4131

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2	Full Name Of Inventor	Family Name FRANKE	First Given Name Kell	Second Given Name Erik
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1	Post Office Address	Post Office Address Øster Søgade 10	City DK-1357 Copenhagen K	State & Zip Code/Country Denmark
Signature of Inventor 201:				Date:
[Signature]				22 June 1998

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

- (1) prior art cited in search reports of a foreign patent office in a counterpart application, and
- (2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

- (1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim;
- (2) It refutes, or is inconsistent with, a position the applicant takes in:
 - (i) Opposing an argument of unpatentability relied on by the Office, or
 - (ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

- (1) Each inventor named in the application;
- (2) Each attorney or agent who prepares or prosecutes the application; and
- (3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.